

● PRINTER RUSH ●

(PTO ASSISTANCE)

Application : <u>09/659375</u>	Examiner : <u>Finerman</u>	GAU : <u>2872</u>
From : <u>JA</u>	Location : <u>IDC</u> FMF FDC	Date : <u>1-13-02</u>

Tracking #: 1004112 Week Date: 11-28-05

DOC CODE	DOC DATE	MISCELLANEOUS
<input type="checkbox"/> 1449	_____	<input type="checkbox"/> Continuing Data
<input type="checkbox"/> IDS	_____	<input type="checkbox"/> Foreign Priority
<input type="checkbox"/> CLM	_____	<input type="checkbox"/> Document Legibility
<input type="checkbox"/> IIFW	_____	<input type="checkbox"/> Fees
<input type="checkbox"/> SRFW	_____	<input checked="" type="checkbox"/> Other
<input checked="" type="checkbox"/> DRW	_____	<u>Amendment</u>
<input type="checkbox"/> OATH	_____	
<input type="checkbox"/> 312	_____	
<input type="checkbox"/> SPEC	_____	

[RUSH] MESSAGE: There is AN AMENDMENT replacing the 2nd & 3rd PARAGRAPHS ON PAGE 8 LINES 29-40, but there ARE NO MARKINGS to indicate what IS being deleted & what is being Added.

THANK YOU

[XRUSH] RESPONSE: The change is to remove the paragraph break between "210." and "The width." Grant did not have paragraph break here (see attached). Amendment corrects typo introduced into the reissue application, so no "markings" were needed.

INITIALS: dsf

NOTE: This form will be included as part of the official USPTO record, with the Response document coded as XRUSH.
REV 10/04

TABLE 1-continued

(First Example Embodiment)				
Optical System Specifications				
Surf. No.	r	d	Material	Group
0	—	70.000000		R
1	-497.01528	15.000000	CaF ₂	A ₁₁
2	-2089.03221	0.100000		
3	4955.40172	35.000000	SiO ₂	A ₁₁
4	-684.52303	0.100000		
5	373.53254	40.000000	SiO ₂	A ₁₂
6	-458.84391	32.494228		
7	-384.75862	15.000000	SiO ₂	A ₁₃
8	399.06352	11.499839		
9	∞	0		
10	∞	15.000000		
11	∞	0		
12	∞	30.000000		
13	∞	0		
14	∞	15.805933		
15	360.53651	60.000000	CaF ₂	A ₂
16	-357.18478	1.000000		
17	-410.75622	15.100000	SiO ₂	A ₂
18	272.78252	3.000000		
19	264.76319	55.000000	CaF ₂	A ₂
20	-403.51844	8.000000		
21	-313.01237	15.000000	SiO ₂	A ₂
22	-536.13663	141.754498		
23	753.93969	16.200000	SiO ₂	A ₂
24	350.20343	24.941513		
25	502.28185	22.500000	SiO ₂	A ₂
26	1917.58499	72.939269		
27	696.45818	25.920000	CaF ₂	A ₂
28	422.44154	45.000000		
29	-165.29930	15.000000	SiO ₂	A ₂
30	-247.15361	7.435035		
31	447.76970	40.000000	SiO ₂	A ₂
32	-650.53438	176.819005		
33	-207.03257	15.000000	SiO ₂	A ₂
34	3807.25755	27.000000		
35	∞	0		
36	316.26451	27.000000	(M ₁)	A ₂
37	-3807.25755	15.000000	SiO ₂	A ₂ *
38	207.03257	176.819005		
39	650.53438	40.000000	SiO ₂	A ₂ *
40	-447.76970	7.435035		
41	247.15361	15.000000	SiO ₂	A ₂ *
42	165.29930	45.000000		
43	-422.44154	25.920000	CaF ₂	A ₂ *
44	-696.45818	72.939269		
45	-1917.58499	22.500000	SiO ₂	A ₂ *
46	-502.28185	24.941513		
47	-350.20343	16.200000	SiO ₂	A ₂ *
48	-753.93969	141.754498		
49	536.13663	15.000000	SiO ₂	A ₂ *
50	313.01237	8.000000		
51	403.51844	55.000000	CaF ₂	A ₂ *
52	-264.76319	3.000000		
53	-272.78252	15.000000	SiO ₂	A ₂ *
54	410.75622	1.000000		
55	357.18478	60.000000	CaF ₂	A ₂ *
56	-360.53651	15.805933		
57	∞	0		
58	∞	30.000000		
59	∞	0		
60	∞	130.000000		M ₂
61	408.08942	20.000000	SiO ₂	B ₁
62	203.49020	3.000000		
63	207.52684	30.000000	CaF ₂	B ₁
64	19354.35793	0.100000		
65	429.85442	35.000000	SiO ₂	B ₁
66	-403.83438	14.478952		
67	-353.07980	15.000000	SiO ₂	B ₁
68	261.24968	31.363884		
69	-219.57807	23.000000	SiO ₂	B ₁
70	-348.23898	1.990938		
71	502.56605	40.000000	CaF ₂	B ₁

TABLE 1-continued

(First Example Embodiment)				
Surf. No.	r	d	Material	Group
5	72	-747.25197	421.724019	
	73	638.73572	29.160000	SiO ₂ B ₁
	74	-809.39570	0.079197	
	75	316.55680	32.805000	SiO ₂ B ₁
	76	309.57052	15.000000	
	77	—	54.627545	S
10	78	213.28576	51.714105	CaF ₂ B ₂
	79	-7409.32571	13.778100	
	80	-616.12401	39.000000	SiO ₂ B ₂
	81	-1209.66082	0.373771	
	82	472.08983	39.000000	SiO ₂ B ₂
	83	1043.43948	0.267894	
15	84	103.01598	49.409891	SiO ₂ B ₂
	85	77.85822	9.349712	
	86	81.54405	32.465682	CaF ₂ B ₂
	87	6656.48506	3.061800	
	88	-400.35184	13.094819	SiO ₂ B ₂
	89	-922.72813	1.399628	
20	90	1101.31959	16.951746	SiO ₂ B ₂
	91	-554.93212	1.641793	
	92	1392.34272	16.702978	SiO ₂ B ₂
	93	3939.24661	15.000000	
	94	∞		W

FIG. 4 provides graphs of transverse aberrations of the first example embodiment for several values of image height Y at three wavelengths. As is apparent from FIG. 4, the transverse aberrations are well-corrected even at the full numerical aperture.

In the first example embodiment, the optical projection system does not project the entire reticle R onto the wafer W in a single exposure. Rather, as shown in FIG. 2(a), an illuminated region 221 of the reticle R is projected onto a corresponding exposure region 231 on the wafer W (FIG. 2(c)). In the first embodiment, the illuminated region 221 is rectangular, 120 mm long and 24 mm wide. The length of the illuminated region 221 is symmetrically placed with respect to a line 222 perpendicular to the optical axis 210. The width of the illuminated region 221 is such that the illuminated region 221 extends from 52 mm to 76 mm from a line 223 perpendicular to the optical axis 210.

The pattern from the entire reticle R is transferred to the wafer W by synchronously scanning both the reticle R and the wafer W during exposure of the wafer W. Arrows 241, 242 indicate the scan directions for the reticle R and the wafer W, respectively. It will be apparent that other shapes and sizes of the illuminated region can be used.

In the first example embodiment, the turning mirror M₂ receives light reflected by the concave mirror M₁ and directs the light to the second imaging system B. The invention also provides an alternative arrangement in which the turning mirror M₂ receives light from the single-pass lens group and directs the light to the double-pass lens group and the concave mirror M₁. Light reflected by the concave mirror M₂ then propagates directly to the second imaging system without reflection by the turning mirror M₁. In the first example embodiment and in such a modification of the first example embodiment, the turning mirror M₁ thus separates light propagating from the double-pass optical group A₂ and light propagating to the double-pass optical group A₂.

A second example embodiment of the invention is shown in FIG. 5. The optical projection system of FIG. 5 is similar to that of the embodiment of FIG. 2. Light from an illuminated region 321 (FIG. 3(a)) of a reticle R is directed to, beginning nearest the reticle R and along an optical axis 310, a single-pass lens group A₁ comprising a first negative